

STATE OF NEW HAMPSHIRE

INTER-DEPARTMENT COMMUNICATION

FROM Richard M. Lane
Engineering Geologist

DATE January 5, 2012
AT Materials and Research
Geotechnical Section

SUBJECT Geotechnical Investigation Report (Bridge)
U.S. Route 302 over Sawyer River, Br. No. 235/059
Harts Location 16396A

TO Joseph C. Adams
Project Engineer

This report documents the preliminary field investigation performed for the subject project and the information obtained. ***This report supersedes the original report, dated November 21, 2011.***

Information used in the preparation of this report included the following:

- Geotechnical Report (Bridge Only), U.S. Route 302 over Sawyer River, Br. No. 235/059, Harts Location P-4366, BRF-032-1(20), dated June 21, 1989.
- Geohydrology and Water Quality of Stratified-drift Aquifers in the Saco and Ossipee River Basin, east-central New Hampshire, By Richard Bridge Moore and Laura Medalie, US Geological Survey, Water-resources Investigation Report 94-4182, 1995.

1.0 Background Information – The project site is located within the White Mountain National Forest along U.S. Route 302 in Harts Location, approximately 4 miles north of the Bear Notch Road/Route 302 intersection. Sawyer River flows in an easterly direction across the site and crosses below Route 302 through an existing 95 foot long single span, concrete bridge structure. The 1989 design plans for the existing bridge indicate that a spread footing was supported by a naturally deposited, undisturbed fluvial deposit for the north and south abutment foundations.

The existing Route 302 Bridge over the Sawyer River was damaged during Tropical Storm Irene in August 2011. Traffic has been detoured on to a temporary bridge located just downstream, between the Route 302 Bridge and the railroad bridge.

The Sawyer River at this site is approximately 40 feet wide under normal flow conditions and was generally less than 3 feet deep during the fall 2011 exploration program. The river bed and exposed river bank are covered with numerous cobbles and boulders (Pictures 1 and 2).

The US Geological Survey Report on the Geohydrology and Water Quality of Stratified-drift Aquifers in the Saco and Ossipee River Basin states the valley of the Saco River consists of glacially derived deposits of very coarse material (largely gravel and sand including large boulders). Although the report lists no wells in the vicinity of the roadway bridge over the Sawyer River, interpreted seismic-refraction data collected by the US Geological Survey

indicates the depth to bedrock in the vicinity of the Route 302 Sawyer River bridge may be approximately 130± feet. This interpreted bedrock surface information has not been confirmed with test borings or drilled wells.

2.0 Scope of Exploration Program – Test borings (B01 through B04) were undertaken to determine the subsurface conditions at the proposed location for the new Route 302 bridge, north and south abutments. Test borings (B1 through B4) were conducted in 1989 for the existing bridge.

2.1 Test Borings for New Proposed Bridge – The exploration program conducted in October 2011 and November 2011 by NHDOT crews consisted of four test borings (B01 through B04) taken at the approximate locations of the four corners of the new proposed bridge abutments. The borings were located by the NHDOT Survey Section. The locations of the 2011 subsurface explorations are plotted on the 2011 Boring Location Plan (Figure 1). The test boring logs are provided in Appendix A. Elevations were measured by the Survey Section.

Standard Penetration Tests (SPT) were conducted in the test borings in general accordance with AASHTO T206 standards. The SPT consists of a 1-3/8 inch inside diameter sampler driven in 6-inch increments, using a 140-pound hammer dropped 30 inches. N-size (approximate 1-7/8 inch) rock cores were also obtained in selected test borings. Due to cobbles and boulders encountered during the drilling process, segments of the test borings were advanced with a spin shoe diamond, roller bit and/or NX core barrel. There was periodic loss of water during advancement of the test borings, plugging up of the spin shoe diamond and damage to the split spoon sampler. Therefore, samples were not recovered from portions of the test borings and in some cases observations were limited to the wash water and the rate of advancement.

2.2 Test Borings for Existing Bridge – The existing bridge test borings (B1 through B4) were completed in April 1989 by NHDOT drill crews. Standard Penetration Tests (SPT) were conducted in these test borings, and advancement was accomplished with NX and AX sized rock core tooling through cobbles and boulders. The 1989 test boring logs are provided in Appendix B and their locations are shown on the 1989 Boring Location Plan (Figure 2).

3.0 Data Presentation – This section summarizes our interpretation of the subsurface conditions and a general description of the soils encountered in the subsurface explorations.

3.1 Soil and Bedrock Conditions – Subsurface deposits include the following strata, proceeding downward from the ground surface. Any one or several units may be absent or in a different sequence at specific locations in the field. The exploration logs should be referenced for a more detailed description of subsurface conditions at their specific locations.

- Asphalt Pavement - A layer of asphalt pavement (0.4 feet thick) was encountered at the surface in two of the test borings (B03 and B04).
- Miscellaneous Fill - This deposit represents materials placed during previous site development work, which includes the existing roadway and bridge facilities, and underground utilities. When encountered, the miscellaneous fill in the test borings

generally consisted of gravelly coarse to fine sand and medium to coarse sand with lesser amounts of silt and gravel. The density ranged from loose to very dense. Cobbles and boulders were encountered within the fill. Test borings B03 and B04 encountered a concrete approach slab with reinforcing rebar at a depth of approximately 4 feet.

- **Glaciofluvial** – This deposit represents materials placed by streams flowing from glaciers. The deposit was typically described as coarse to fine sand, gravelly coarse to fine sand, coarse to fine sandy gravel and silty coarse to fine sand. Cobbles and boulders were encountered within the deposit. The density ranged from medium dense to very dense.

3.2 Summary of Test Boring Data – The 2011 test borings were advanced through the existing embankment fill into the underlying glaciofluvial deposit. These test borings encountered fill ranging in thickness from 16.0 to 23.0 feet. The two test borings (B03 and B04) taken for the southern abutment encountered asphalt pavement over fill with a concrete approach slab at a depth of approximately 4 feet. The extensive depth of the underlying glaciofluvial deposit resulted in all four borings being terminated before they encountered glacial till or bedrock. The underlying glaciofluvial deposit extends to at least a depth ranging from 100 to 121 feet with the total thickness of the deposit unknown. A summary of the materials encountered in the 2011 test borings are listed in the table below:

SUMMARY OF MATERIALS IN 2011 TEST BORINGS

Test Boring	Depth of Asphalt (ft)	Depth of Fill (ft)	Depth of Glaciofluvial (ft)
B01	N/A	0 – 17.0	17.0 – 100+
B02	N/A	0 – 16.0	16.0 – 100+
B03	0 – 0.4	0.4 – 23.0	23.0 – 121.0+
B04	0 – 0.4	0.4 – 23.0	23.0 – 105.0+

Note: Elevations stated on the boring logs are in feet.

The 1989 test borings encountered natural soil at the ground surface, which was in the approximate elevation range of 867 to 875 at the time. These test borings were terminated at depths ranging from 23.0 to 34.3 feet (El. 839.8 to El. 845) below the ground surface.

Cobbles and boulders were encountered throughout the glaciofluvial soil in both the 1989 and 2011 test borings, sometimes concentrated in pockets and layers within the deposit. The 1989 test borings (B1 through B4) encountered cobbles and boulders throughout their soil profile. Test borings B01 and B02, taken for the northern abutment, encountered fewer cobbles and boulders below elevations 810± and 805±, respectively. Test borings B03 and B04, taken for the southern abutment, encountered fewer cobbles and boulders below elevation 825± (Figure 3 - Subsurface Fence Diagram). Test boring B03 encountered a zone of numerous cobbles at a depth of 110 to 115 feet (El. 770.3 to El. 765.3).

3.3 Laboratory Test Results – Representative soil samples were recovered from test borings taken for the proposed bridge abutments. Very fine soils were washed through a #200 sieve according to AASHTO T-11 standards to determine the percentage of silt

and clay sized particles. Granular soils were run through a series of different sized sieves according to AASHTO T-27 standards to develop grain size distribution curves.

Appendix C contains grain size distribution curves developed from the results of the AASHTO T-27 sieve analyses conducted on soil samples recovered from test borings B01 and B04.

3.4 Groundwater - Groundwater levels and corresponding elevations generally refer to the recorded groundwater measured at the completion of the exploration, which may not represent stabilized groundwater conditions. Groundwater at the site is expected to vary seasonally and with changes in temperature, precipitation, runoff and modification of the existing topography.

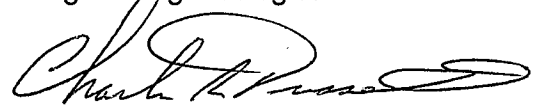
Groundwater was encountered in the 2011 test borings at depths ranging from 16.7 to 20.6 feet (El. 858.0 to 861.7) below the ground surface. The groundwater in the 1989 test borings was encountered at depths ranging from 5.6 to 12.5 feet (El. 860.4 to 863.9) below the then existing ground surface.

Please contact us at 271-3151, if you have further questions or need additional information.

Sincerely,



Richard M. Lane, PG, CPG
Engineering Geologist



Charles R. Dusseault, PE
Geotechnical Section Chief

enc: Pictures (1 and 2)
Figure 1 - Test Boring Location Plan (2011)
Figure 2 - Test Boring Location Plan (1989)
Figure 3 - Subsurface Fence Diagram
Appendix A - 2011 Test Boring Logs (B01 through B04)
Appendix B - 1989 Test Boring Logs (B1 through B4)
Appendix C - Grain Size Distribution

cc: Theodore Kitsis, Bureau of Construction
Charles Dusseault, Bureau of Materials & Research (file copy)



Picture 1 - Sawyer River bed and exposed river bank are covered with numerous cobbles and boulders

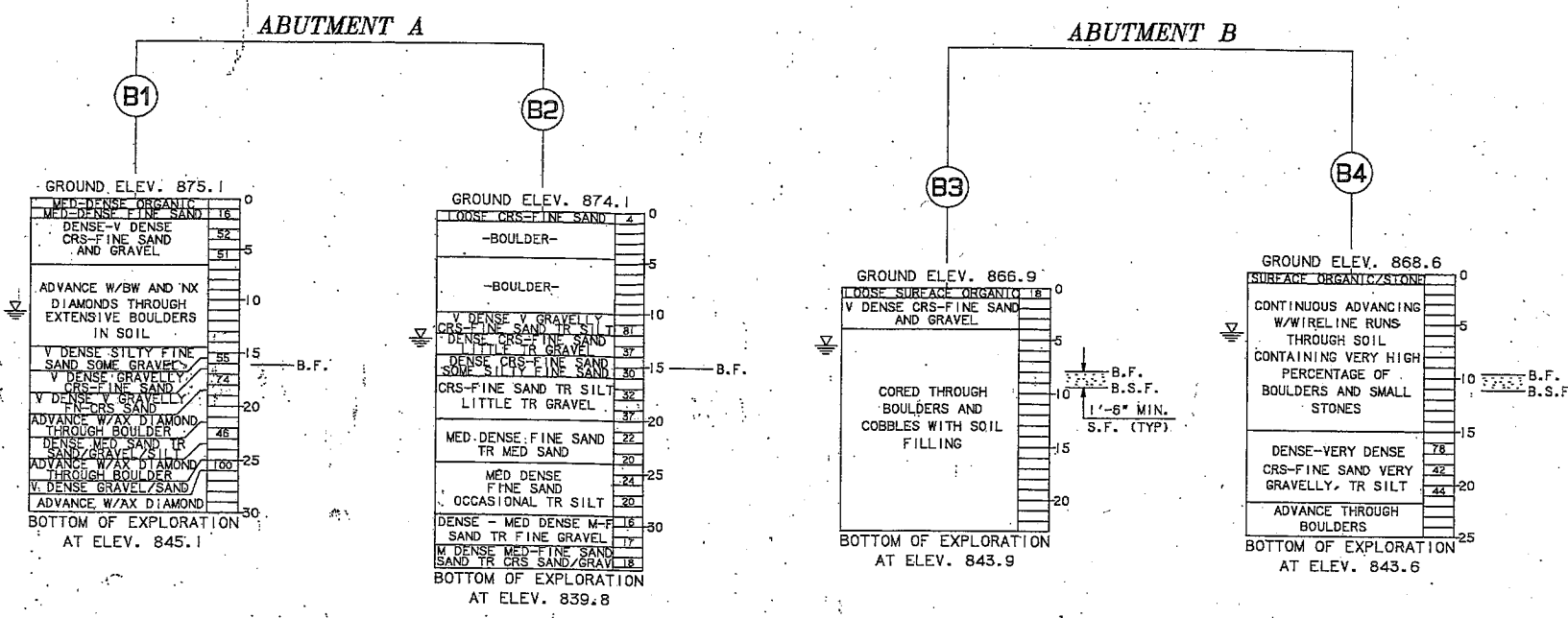


Picture 2 - River bank of Sawyer River covered with cobbles and boulders



Figure 1 - 2011 Exploration Location Plan

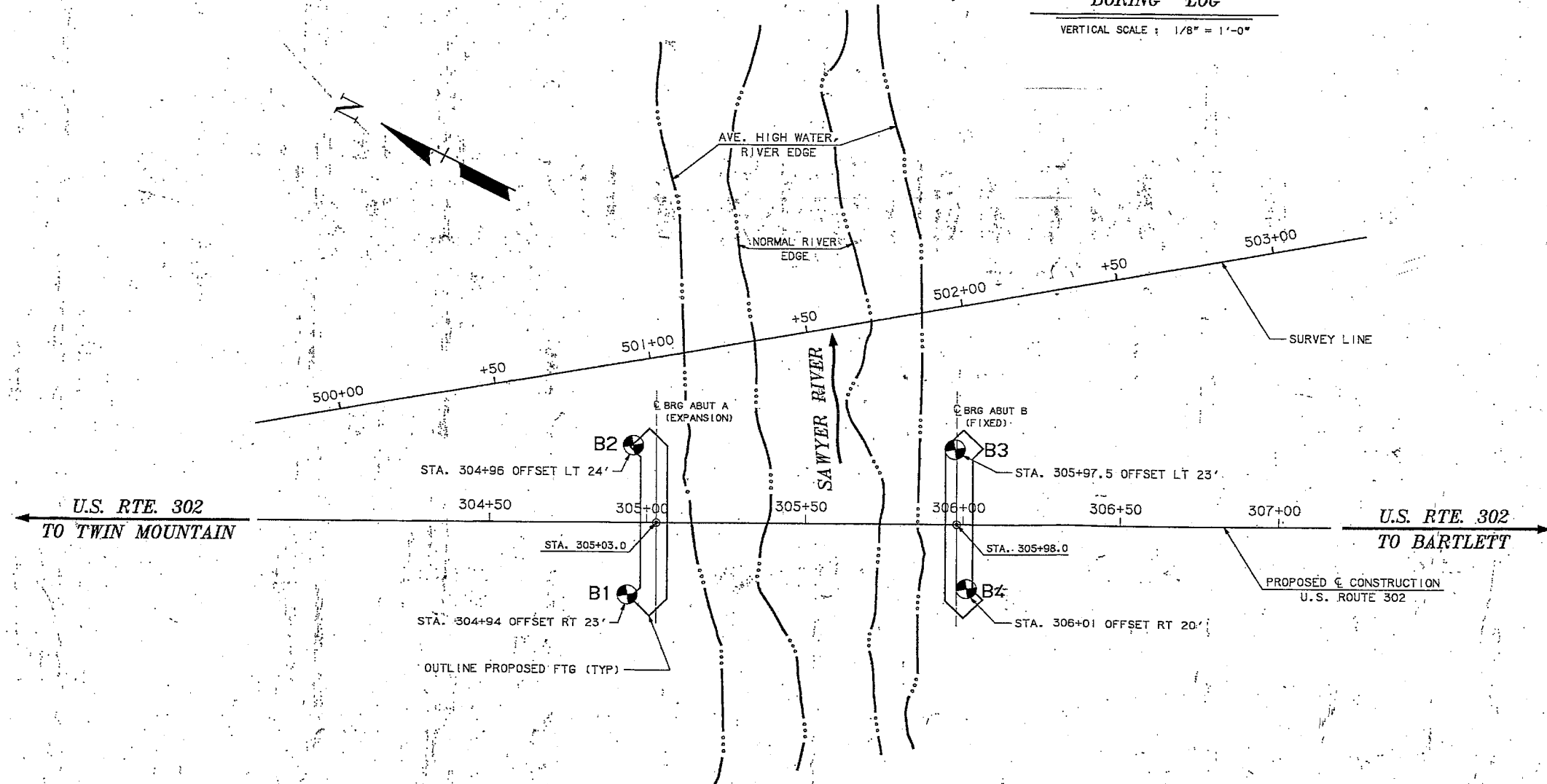
Figure 2
Test Boring Location Plan (1989)



BORING LOG

VERTICAL SCALE: 1/8" = 1'-0"

B.F. = BOTTOM OF FOOTING (ELEV 859.00)
B.S.F. = BOTTOM OF STRUCTURAL FILL



BORING NOTES

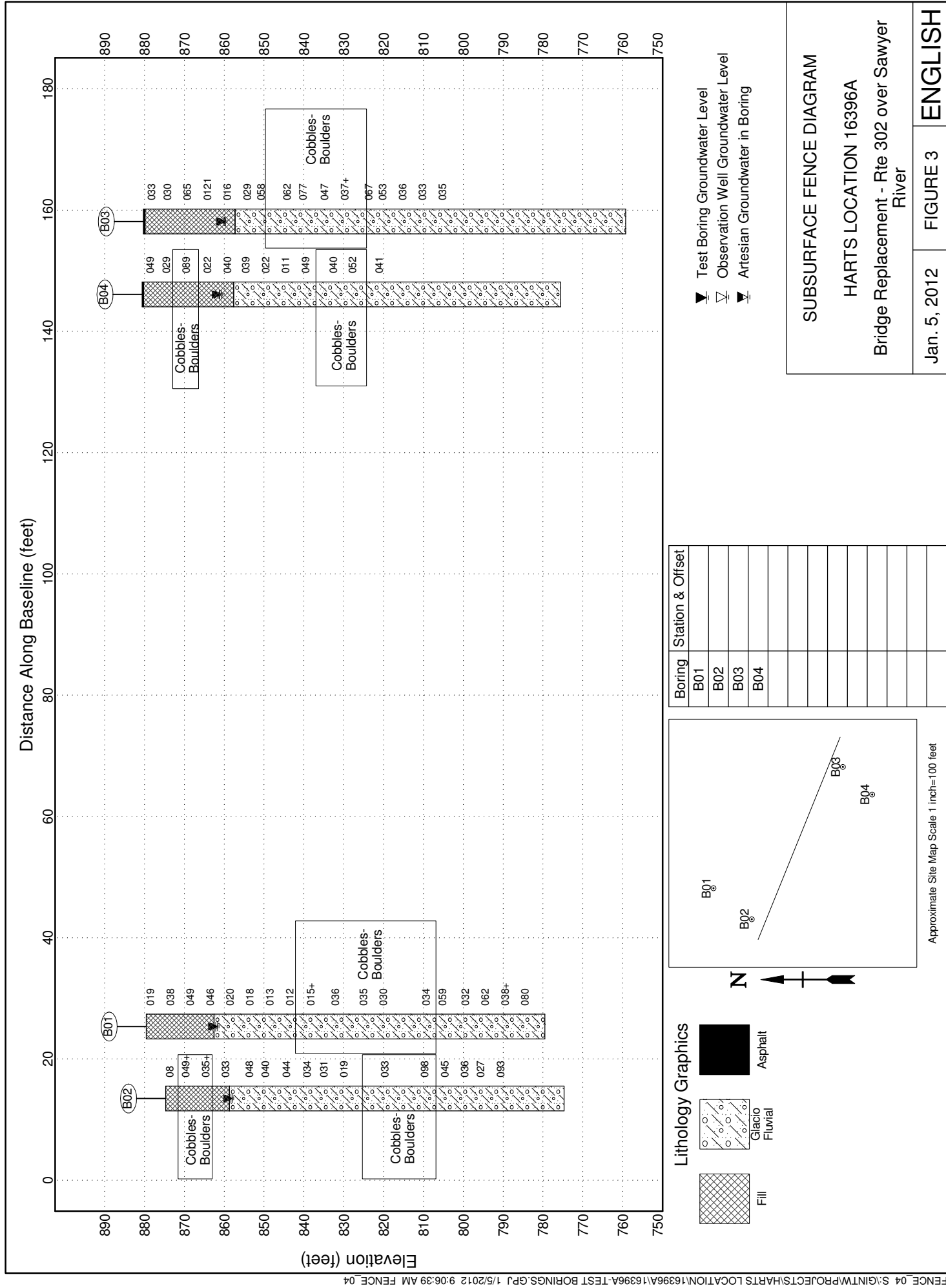
- (1) BORINGS INDICATED THUS WERE MADE BY THE NHDOT IN APRIL OF 1989. FIGURES IN THE RIGHT HAND COLUMN INDICATE THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2" O.D. STANDARD SPLIT SPOON SAMPLER ONE FOOT, USING A 140 LB. WEIGHT FALLING 30 INCHES.
- (2) BORINGS ARE FOR DESIGN PURPOSES SHOWING CONDITIONS AT BORING POINTS ONLY, AND DO NOT NECESSARILY INDICATE MATERIAL TO BE ENCOUNTERED DURING CONSTRUCTION.
- (3) THE SOILS REPORT IS AVAILABLE IN THE NHDOT BRIDGE DESIGN BUREAU OFFICE FOR A MORE DETAILED SOILS DESCRIPTION.
- (4) ROCK CORES WERE MADE USING AN AX 1 1/8" I.D. CORE BARREL.

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN									
TOWN	HARTS LOCATION		BRIDGE NO.	235/059		STATE PROJECT	P-4366		
LOCATION	U.S. 302 OVER SAWYER RIVER								
BORINGS AND BORING LAYOUT									
BY	DATE	CHECKED	BY	DATE	REVISIONS AFTER PROPOSAL	DATE	BRIDGE SHEET		
DESIGNED	JCA	3/90	CHECKED	ABP	6/90		3 OF 20		
DRAWN	CAC	7/89	CHECKED	ABP	6/90		FILE NUMBER		
TRACED			CHECKED				2-6-2-3		
QUANTITIES	JCA	7/90	CHECKED	ABP	8/90		FEDERAL PROJECT NO.	SHEET NO.	TOTAL SHEETS
							BRF-032-1(20)	15	45

BORING LAYOUT

SCALE: 1" = 20'-0"

WINDOW NAME	DRAWING NAME	*RFB FILE NAME	SHEET SCALE
BORINGS	BORINGS	BR-SITE.FGB	AS NOTED



Appendix A
2011 Test Boring Logs
(B01 through B04)

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B01**

SHEET NO. 1 OF 3

STA. OFF.

BASELINE Route 302 CL

ELEVATION (ft) 879.6

START/END 10/25/11 / 10/28/11

DRILLER C. Cleveland (NHDOT)

INSPECTOR Doug Rogers

CLASSIFIER DRR

EAST/NORTH (ft) 1067490/577973

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059
DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	NW	NX
10/27/11	7:30 am	17.4	862.2	63.5	64.9	SIZE I.D. (in):	1.375	3	1.875
10/28/11	7:30 am	17.9	861.7	89.0	88.1	HAMMER WT. (lb):	140	DRILL RIG CME 45-C Trlr	
						HAMMER FALL (in):	30		
						HAMMER TYPE:	Automatic		

DEPTH (ft)	STRATUM CHANGE (ft)	BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
0		3			0.0	Medium dense, dark greyish brown and dark yellowish brown, gravelly MEDIUM-FINE SAND, little coarse sand, little-trace silt	
		8	S1	1.0 [50]			
		11					
		12			2.0		
						Note: Advanced hole to 5.0' w/ 4" roller bit; cutting boulder from approximately 2.5'-4.9'; attempted to drive 3" casing to sampling depth - no success as casing kept deflecting off edge of boulder; forced to utilize spin shoe diamond to advance hole	
5		22			5.0		
		30	S2	0.4 [20]		Dense, greyish brown, gravelly MEDIUM-FINE SAND, trace coarse sand, slight trace of silt	
		8				Note: split spoon damaged (bent) most likely between cobbles	
		5			7.0		
						Noted no water return during advancement of hole to 10.0'	
						-FILL-	
10		5			10.0		
		16	S3	1.2 [60]		Dense, dark greyish brown and dark yellowish brown, gravelly COARSE-FINE SAND, little silt	
		33			12.0		
		35			12.0		
			C1	0.4 [13]		Advanced hole to 15.0' utilizing Nx core barrel; recovered coarse-fine gravel-sized stones (discarded); damaged spin shoe diamond while attempting to spin 3" casing to desired depth; re-inserted 3" casing with drive shoe then drove casing to 15.0'	
15		29			15.0		
		27	S4	1.3 [65]		Dense, dark yellowish brown, MEDIUM-FINE SAND, little coarse sand, little silt, little to trace fine gravel	
		19			17.0		
	17.0					No cobbles or boulders encountered while advancing to 20.0'; able to easily drive casing to desired sampling depth	
20		13			20.0		
		9	S5	1.2 [60]		Medium dense, greyish brown, MEDIUM-FINE SAND, little-trace coarse sand, trace gravel, trace silt	
		11					
		12			22.0		
						Able to drive casing to 25.0' as no cobbles or boulders were encountered	
						-GLACIAL FLUVIAL-	
25		11			25.0		
		8	S6	1.0 [50]		Medium dense, greyish brown, FINE SAND	
		10					
		10			27.0		
						Able to easily advance casing to 30.0' as no cobbles/boulders encountered	

SAMPLER IDENTIFICATION		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard				
NR	Not Recorded	> 60	Very Hard				
				WOR - Weight of Rod WOH - Weight of Hammer		ENGLISH	

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B01**

SHEET NO. 2 OF 3

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 879.6

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30			5			30.0	Medium dense, greyish brown w/ traces of dark yellowish brown, MEDIUM-FINE SAND, little-trace silt, trace fine gravel, trace coarse sand	
			6	S7	1.2 [60]			
			7					
			9			32.0	-GLACIAL FLUVIAL-	
35			7			35.0	Medium dense, dark yellowish brown, MEDIUM-FINE SAND, little silt, little-trace fine gravel, trace coarse sand	
			5	S8	1.3 [65]			
			7					
			12			37.0	Note: boulder encountered from 38.5'-40.1'; material appears to be much coarser from 38.5' with much greater % of stone; also noted no water return while advancing hole to 40.2'; replaced drive shoe w/ new spin shoe diamond	
40			7			40.2	Dark yellowish brown and dark greyish brown, MEDIUM-FINE SAND, trace fine gravel, trace coarse sand	
			15/0.1	S9	0.4 [67]	40.8		
				C2	2.4 [55]		Advanced hole through boulder (40.8'-41.8'), cobbles and gravelly sand with no water return; barrel plugged at 45.2' - further advanced w/ 3" roller bit to 46.4' through gravelly sands	
45						45.2		
			16			46.4	Dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt to "silty"	
			19	S10	1.2 [60]			
			17					
			12			48.4	Note: damaged spin shoe diamond while attempting to advance hole to 50.0' through numerous cobbles; replaced w/ new and continued advancement	
50			60/0.2	S11	0.0 [0]	50.0	S11, 50' - 50.2', no recovery. Boulder encountered from 50.2'-51.1', occasional cobble thereafter while further advancing to 53.5'	
			14			53.5	Dense, dark yellowish brown-light olive brown, gravelly COARSE-FINE SAND, some silt to "silty"	
			11	S12	0.6 [30]			
			24					
55			27			55.5	Hole advanced through numerous small cobbles, coarse gravel to 58.5'	
			19			58.5	Dense, similar to S12	
			23	S13	0.4 [20]			
			7					
60			24			60.5		
			90/0.2	S14	0.0 [0]	63.5	S14, 63.5' - 63.7', no recovery. Refusal on cobble (63.5'-63.9')	
65							Advanced hole to 69.2' w/ 3" roller bit; spun casing to same w/ no water return and many cobbles encountered	

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B01**

SHEET NO. 3 OF 3

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 879.6

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
70			15			69.2	Dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt, isolated 1/2" layer of fine sand	
			19	S15	0.8 [40]			
			15					
			20			71.2		
75			22			73.3	Very dense, dark yellowish brown and light olive brown, gravelly COARSE-FINE SAND, some silt to "silty", cobbles likely	
			24	S16	0.7 [35]			
			35					
			33			75.3		
80							Noted cobble from approximately 78.2'-78.8'	
			27			79.0		
			15	S17	0.8 [40]			
			17			81.0		
85							Still no water return observed while advancing to 84.0'	
			17			84.0		
			23	S18	0.8 [40]			
			39			86.0		
90							-GLACIAL FLUVIAL-	
			28			89.0		
			18	S19	0.8 [62]			
			20/0.3			90.3		
95							Dark yellowish brown, gravelly COARSE-FINE SAND, some-little silt, over grey-olive grey, silty FINE SAND, little gravel, trace coarse-medium sand	
95			31			94.0	Note: driller had difficult time attempting to spin casing due to spin shoe diamond repeatedly plugging up with sand; drill "bogging down" during this process; large amount of grey and dark grey medium and fine sands being brought to surface; material became coarser w/ occasional stones from approximately 93.5'	
			41					
			39	S20	1.5 [75]			
			61			96.0		
100							Very dense, dark yellowish brown, silty COARSE-FINE SAND, little gravel	
							Advanced hole to 100.0' w/ 3" roller bit; occasional small cobble, gravelly sands encountered	
							Bottom of Exploration @ 100.0 ft (El. 779.6)	

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B02**

SHEET NO. 1 OF 3

STA. OFF.

BASELINE Route 302 CL

ELEVATION (ft) 874.7

START/END 10/31/11 / 11/4/11

DRILLER P. Huckins (NHDOT)

INSPECTOR Doug Rogers

CLASSIFIER DRR

EAST/NORTH (ft) 1067465/577941

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059
DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	NW	NX
						SIZE I.D. (in):	1.375	3	1.875
11/1/11	7:30 am	dry		14.0	13.5	HAMMER WT. (lb):	140	DRILL RIG CME 45 Truck	
11/2/11	7:30 am	16.4	858.3	43.7	43.7	HAMMER FALL (in):	30		
11/3/11	7:30 am	16.7	858.0	64.0	64.9	HAMMER TYPE:	Automatic		

DEPTH (ft)	STRATUM CHANGE (ft)	BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
DEPTH	ELEVATION						
0		1			0.0	Loose, dark yellowish brown, MEDIUM-FINE SAND, some-little gravel, little coarse sand, little silt	
		4	S1	0.7 [35]			
		4			2.0		
		3				Advanced hole to 4.0' utilizing 4" roller bit; spun 3" casing w/ casing diamond to same; cobbles encountered throughout	
		9	S2	0.8 [89]	4.0	Dark yellowish brown, MEDIUM-FINE SAND, little to trace coarse sand, little-trace silt, trace fine gravel	
5		49/0.4			4.9		
						-FILL-	
						Advanced hole to 9.0' w/ 3" roller bit; cut through boulder (4.9'-7.3') and an occasional cobble; spun 3" casing to same	
		9	S3	0.3 [50]	9.0	Dark yellowish brown, gravelly COARSE-FINE SAND, little-trace silt	
10		35/0.1			9.6		
			C1	1.2 [86]	11.0		
						Advanced hole w/ Nx core barrel to 11.0'; cut boulder from 9.6'-10.8'	
		42			14.0	Dense, greyish brown and dark yellowish brown, gravelly COARSE-FINE SAND, little silt	
15		15	S4	0.7 [35]			
		18			16.0		
	16.0	858.7	39			Note: outside of spoon gouged during SPT; most likely driven between cobbles/small boulders	
						Advanced hole to 20.0' by spinning 3" casing; cut through boulder from approximately 18.9'-19.8'; damaged spin shoe diamond in process - replaced w/ new and re-advanced hole to 20.0'	
		40	S5	0.4 [20]	20.0	Dense, dark yellowish brown, gravelly COARSE-FINE SAND, trace silt	
20		23			22.0		
		25					
		21				-GLACIAL FLUVIAL-	
		21	S6	0.4 [20]	24.0	Dense, similar to S5	
25		21			26.0		
		19					
		15					

SAMPLER IDENTIFICATION		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard				
NR	Not Recorded	> 60	Very Hard				
WOR - Weight of Rod WOH - Weight of Hammer							
ENGLISH							

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B02**

SHEET NO. 2 OF 3

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 874.7

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30			16			29.3	Dense, dark greyish brown and dark yellowish brown, coarse-fine sandy GRAVEL, some silt, cobble at 31.1'	
			19	S7	0.6 [33]			
			25 20/0.3			31.1		
35							Advanced hole to 34.5' w/ 3" roller bit; occasional cobble encountered	
			6			34.5		
			17 17 12	S8	0.9 [45]	36.5		
40							Dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt to "silty" over MEDIUM-FINE SAND, some silt, trace coarse sand	
			22			38.7		
			16 15 8	S9	0.8 [40]	40.7		
45							Hole advanced easily to 43.7' w/ no cobbles/boulders encountered	
			12			43.7		
			9 10 13	S10	1.2 [60]	45.7		
50							Medium dense, dark yellowish brown, MEDIUM-FINE SAND, little silt, little-trace fine gravel, trace coarse sand	
55							-GLACIAL FLUVIAL-	
60			60/0.3	S11	0.2 [67]	48.9 49.2	Dark yellowish brown, gravelly COARSE-FINE SAND, some silt	
65							Advanced hole to 54.0' w/ 3" roller bit; cut through cobble from 49.2'-49.6' as well as occasionally others while advancing to 54.0'; damaged spin shoe diamond - replaced w/ new and re-advanced casing	
			21			54.0		
			21 12 17	S12	0.6 [30]	56.0		
65							Dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt	
65							Advanced hole to 64.0'; cut through boulder from approximately 58.7' to 59.9' as well as numerous small cobbles; noted that sand began to enter inside casing (2-3') from 60.0' preventing SPT at 60.0'; once again at 64.0' (3-4') where driller re-washed casing in order to sample (0.3' remained inside casing after 2nd wash)	
65							Very dense, dark yellowish brown and dark greyish brown, gravelly COARSE-FINE SAND, some-little silt Note: outside of split spoon gouged and tip damaged; likely driven	
			21 61 37	S13	0.7 [35]	64.0		

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B02**

SHEET NO. 3 OF 3

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 874.7

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
			50			66.0	between cobbles/boulders	
							Hole advanced through numerous cobbles to 69.0'	
70			14 21 24 19	S14	0.2 [10]	69.0 71.0	Dense, dark greyish brown, gravelly COARSE-FINE SAND Note: 2-3" of material inside casing prior to sampling	
75			9 17 19 16	S15	0.3 [15]	74.0 76.0	Dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt to "silty"	
80			10 14 13 31	S16	0.8 [40]	78.0 80.0	Dense, similar to S15, slightly less coarse	
85			44 54 39 39	S17	1.3 [65]	83.0 85.0	Very dense, dark yellowish brown and dark greyish brown, gravelly COARSE-FINE SAND, some silt over greyish brown and yellowish brown, silty FINE SAND w/ 2" layer of coarse-medium sand (no silt)	
90								
95							Further advanced hole to 100.0' w/ 3" roller bit; encountered only an isolated small cobble or two with most of the material being a gravelly sand to sand with little or no gravel; drill head advanced quite rapidly through last 5' of material (95-100') w/ no stones encountered	
100							Bottom of Exploration @ 100.0 ft (El. 774.7)	

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B03**

SHEET NO. 1 OF 4

STA. OFF.

BASELINE Route 302 CL

ELEVATION (ft) 880.3

START/END 10/31/11 / 11/4/11

DRILLER C. Cleveland (NHDOT)

INSPECTOR Doug Rogers

CLASSIFIER DRR

EAST/NORTH (ft) 1067590/577866

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	NW	
						SIZE I.D. (in):	1.375	3	
11/1/11	7:30 am	20.2	860.1	28.5	30.1	HAMMER WT. (lb):	140	DRILL RIG CME 45-C Trlr	
11/2/11	7:30 am	20.3	860.0	55.0	56.6	HAMMER FALL (in):	30		
11/3/11	7:30 am	20.6	859.7	69.0	66.9	HAMMER TYPE:	Automatic		

DEPTH (ft)	STRATUM CHANGE (ft)	BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
0	0.4	879.9				-ASPHALT PAVEMENT Advanced through "gravelly" material to 1.0' w/ 4" roller bit	
			10		1.0		
			14	S1	1.2 [60]	Dense, dark yellowish brown, MEDIUM-FINE SAND, some gravel, little silt, trace to little coarse sand	
			19				
			16		3.0		
						Advanced hole to 5.0' w/ 3" spin shoe diamond; cored through concrete, rebar rods (approach slab) and small cobble; re-inserted casing and drove to same depth	
5			14		5.0		
			16	S2	1.0 [50]	Dense, dark yellowish brown and greyish brown, MEDIUM-FINE SAND, little silt, little-trace gravel, trace coarse sand	
			14				
			12		7.0		
						-FILL-	
10			31		10.0		
			36	S3	1.1 [55]	Very dense, dark yellowish brown and dark greyish brown, gravelly COARSE-FINE SAND, some silt, cobble(s) likely	
			29				
			32		12.0		
						Note: occasional cobble encountered while advancing to 15.0'	
15			55		15.0		
			85	S4	1.3 [65]	Very dense, yellowish brown and dark yellowish brown, MEDIUM-FINE SAND, some gravel, little-trace silt, trace coarse sand, isolated weathered cobble from approximately 15.5-15.8'	
			36				
			26		17.0		
						Advanced hole to 20.0' w/ 3" roller bit; no cobbles or boulders encountered; able to drive casing to same depth	
20			8		20.0		
			6	S5	0.4 [20]	Medium dense, dark greyish brown, COARSE-FINE SAND, little gravel, isolated wood fragment	
			10				
			5		22.0		
	23.0	857.3					
25			13		25.0		
			18	S6	0.1 [5]	Dense, recovered 3 fine gravel-sized rock fragments in end of spoon tip, most likely pushing larger stone	
			11				
			8		27.0		
						-GLACIAL FLUVIAL-	
			14		28.5		

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard				
NR	Not Recorded	> 60	Very Hard				
				WOR - Weight of Rod WOH - Weight of Hammer		ENGLISH	

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B03**

SHEET NO. 2 OF 4

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 880.3

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30			12 46 50	S7	0.7 [35]	30.5	Very dense, dark yellowish brown, MEDIUM-FINE SAND, trace gravel, trace coarse sand, trace silt, cobbles likely beyond 29.5'; outside of split spoon gouged	
							Advanced hole to 35.0' w/ 3" roller bit; encountered frequent cobbles and boulder from 34.0'-34.9'; replaced casing drive shoe w/ spin shoe diamond and re-advanced hole to 35.0'	
35			16 30 32 24	S8	1.1 [55]	35.0 37.0	Very dense, greyish brown, MEDIUM-FINE SAND, little gravel over dark yellowish brown, coarse-fine sandy GRAVEL, some silt to "silty"	
							Note: encountered numerous cobbles while advancing hole to 39.0'	
40			19 32 45 42	S9	0.7 [35]	39.0 41.0	Very dense, dark yellowish brown, coarse-fine sandy GRAVEL, some silt to "silty"	
							-GLACIAL FLUVIAL-	
							Note: encountered coarse material w/ cobbles throughout while advancing to 44.4'	
45			13 16 31 24	S10	0.8 [40]	44.4 46.4	Dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt to "silty"	
50			16 37/0.3	S11	0.5 [63]	49.5 50.3	Dark greyish brown and dark yellowish brown, coarse-fine sandy GRAVEL, some silt to "silty"	
							Advanced hole to 55.5' through occasional cobble, boulder (54.0'-55.4'); replaced worn roller bit following advancement	
55			15 47 20 24	S12	0.9 [45]	55.5 57.5	Very dense, dark yellowish brown, COARSE-FINE SAND, some-little gravel, some-little silt Note: split spoon bent badly during SPT; replaced with new following S12; also replaced damaged spin shoe diamond and re-advanced casing to 59.0'	
60			16 26 27 27	S13	0.7 [35]	59.0 61.0	Very dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt to "silty"	
65			13 18 18	S14	0.6 [30]	64.0	Dense, dark yellowish brown, COARSE-FINE SAND, some silt, little fine gravel	

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B03**

SHEET NO. 3 OF 4

STA. OFF.

BASELINE Route 302 CL

ELEVATION (ft) 880.3

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
			13			66.0	Note: hole advanced through much less coarse material	
70			15			69.0		
			17	S15	0.3 [15]		Dense, dark greyish brown, gravelly COARSE-FINE SAND, slight trace of silt	
			16					
			21			71.0		
							Note: driller had great difficulty advancing casing to 74.0' due to high pressure build-up caused by the spin bit becoming plugged; no water return for most of the hole	
75			14			74.0	Dense, dark greyish brown, COARSE-FINE SAND, some gravel	
			22	S16	0.5 [25]		Note: prior to sample, 3-4' of material entered up inside casing; driller re-washed casing prior to performing SPT; 3" of material still remained inside casing	
			13					
			12			76.0		
							Driller unable to advance hole utilizing "spin" method to advance casing; drill rig losing power and stalling while attempting to advance; inserted Nx wireline in an attempt to advance hole but casing was bent at around 40.0', preventing core barrel any penetration beyond that point	
80								
85							Advanced hole by "probing" w/ 3" roller bit; water return was evident beyond 79.0'; encountered mainly sands with varying amounts of gravel and an occasional cobble	
90							-GLACIAL FLUVIAL-	
95								
100							Noted sudden, total water loss from approximately 102.5' to 106.0' and from approximately 109.0' to 111.0'	

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B03**

SHEET NO. 4 OF 4

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 880.3

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
105							Continued advancement of borehole by "probing" w/ 3" roller bit to 121.0'; mainly encountered sands w/ varying amounts of gravel and an occasional cobble	
110							-GLACIAL FLUVIAL-	
115							Zone of numerous small cobbles and excessive drill-chatter noted from 110.0' to 115.0'	
120								
125							Bottom of Exploration @ 121.0 ft (El. 759.3)	
130								
135								

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B04**

SHEET NO. 1 OF 4

STA. OFF.

BASELINE Route 302 CL

ELEVATION (ft) 880.6

START/END 10/18/11 / 10/24/11

DRILLER C. Cleveland (NHDOT)

INSPECTOR Doug Rogers

CLASSIFIER DRR

EAST/NORTH (ft) 1067568/577842

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059
DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

GROUNDWATER						EQUIPMENT	SAMPLER	CASING	CORE
DATE	TIME	DEPTH (ft)	ELEV. (ft)	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	S	NW	NX
						SIZE I.D. (in):	1.375	3	1.875
10/20/11	7:00 am	19.4	861.2	40	43.3	HAMMER WT. (lb):	140	DRILL RIG CME 45-C Trlr	
10/21/11	7:30 am	19.5	861.1	51.8	52.2	HAMMER FALL (in):	30		
10/24/11	8:30 am	19.9	860.7	58.5	59.9	HAMMER TYPE:	Automatic		

DEPTH (ft)	STRATUM CHANGE (ft)	BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
0	0.4	880.2				-ASPHALT PAVEMENT-	
			16		1.0	Dense, greyish brown and dark yellowish brown, gravelly COARSE-FINE SAND, trace silt	
			25	S1	1.1 [55]		
			24				
			27		3.0	Advanced hole w/ 4" roller bit to 4.5'; cutting numerous cobbles, small boulder(s); inserted 3" casing w/ diamond spin shoe to further advance to 5.1'; encountered concrete with rebar re-enforcement (approach slab) and damaged spin shoe - replaced w/ new following advancement	
5			8		5.1		
			15	S2	1.3 [65]		
			14		7.1	Dense, yellowish brown w/ traces of greyish brown, MEDIUM-FINE SAND, little silt, little-trace gravel, trace coarse sand	
			9				
						-FILL-	
10			20		10.0	Greyish brown to dark greyish brown and dark yellowish brown, MEDIUM-FINE SAND, some silt to "silty", some gravel, trace coarse sand, cobbles likely Note: outside of spoon damaged (deeply gouged)	
			29	S3	0.8 [53]		
			60		11.5		
						Advanced through numerous cobbles to next sampling depth	
15			16		15.4	Medium dense, greyish brown and dark yellowish brown, gravelly COARSE-FINE SAND, little to trace silt	
			12	S4	0.4 [20]		
			10		17.4		
			11			Note: removed 3" casing (damaged spin shoe diamond) and advanced hole w/ 4" roller bit to 20.4'; re-advanced casing w/ new spin shoe	
20			17		20.4		
			19	S5	0.9 [45]		
			21		22.4	Dense, dark yellowish brown, COARSE-FINE SAND, some gravel, some-little silt	
			15				
	23.0	857.6				Note: cobble encountered from 24.3'-24.8'	
25			18		25.0		
			24	S6	0.7 [35]		
			15		27.0	Dense, dark yellowish brown, COARSE-FINE SAND, some silt, little gravel	
			16				
						-GLACIAL FLUVIAL-	

Sampler Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
S	Standard Split Spoon	Blows/foot	Consistency	Blows/foot	Density	Capitalized Soil Name	Major Component
SL	Large Spoon (O.D.= 3 in)	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	35% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Some	20% - 35%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	1% - 10%
A	Auger Flight	16 - 30	Very Stiff	> 50	Very Dense		
C	Core Barrel	31 - 60	Hard				
NR	Not Recorded	> 60	Very Hard				
				WOR - Weight of Rod WOH - Weight of Hammer		ENGLISH	

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B04**

SHEET NO. 2 OF 4

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 880.6

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
30			8			30.0	Medium dense, dark yellowish brown and dark greyish brown, gravelly COARSE-FINE SAND, some-little silt	
			10	S7	0.4 [20]			
			12			32.0		
			8				Note: able to easily advance hole to 35.0' w/ 3" roller bit; spin shoe diamond burnt - drove casing to 35.0'	
35			7			35.0		
			5	S8	0.3 [15]			
			6				Medium dense, dark greyish brown, COARSE-FINE SAND, some gravel	
			3			37.0		
40			15			40.0	Dense, dark yellowish brown, gravelly COARSE-FINE SAND, some silt to "silty"	
			28	S9	0.5 [25]			
			21			42.0		
			13				Note: split spoon badly damaged during SPT, cobble(s) likely	
45							Removed 3" casing and replaced damaged spin shoe; re-advanced casing to 47.0'; also replaced worn roller bit following the re-advancement; boulder from 44.0'-45.6' and cobble from 46.1'-46.7'	
			9			47.0	Dense, greyish brown, MEDIUM-FINE SAND, little gravel, some-little silt, little coarse sand	
			21	S10	0.8 [40]			
			19			49.0		
			27				Note: split spoon bent during SPT	
50								
			18			51.8	Very dense, light olive brown and dark yellowish brown, MEDIUM-FINE SAND, some gravel to "gravelly", some silt to "silty", little coarse sand, cobble(s) likely, split spoon gouged on outside during SPT	
			17	S11	0.4 [20]			
			35			53.8		
			19				Advanced hole to 55.6' w/ 3" roller bit; cutting boulder from 55.0'	
55								
				C1	0.4 [31]	55.6	Continued to cut through boulder (55.0'-56.0') and coarse gravel; damaged inner barrel catcher - replaced w/ new	
						56.9		
							Drove casing w/ damaged spin shoe to 58.5'	
			14			58.5	Dense, light olive brown and dark yellowish brown, silty COARSE-MEDIUM SAND, some gravel to "gravelly", little fine sand	
			14	S12	0.8 [40]			
			27			60.5		
60			19			60.5	Advanced hole w/ Nx core barrel; recovered cobble and coarse-fine gravel-sized rock fragments; sample discarded	
				C2	0.7 [14]			
65						65.5		

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TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B04**

SHEET NO. 3 OF 4

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 880.6

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
70				C3	0.4 [8]	65.5	Advanced hole w/ Nx core barrel; recovery similar to C2; material being washed out of core barrel is mainly sand w/ varying amount of fine gravel; periodic water loss occurring during advancement; sample discarded	
				C4	0.5 [10]	70.5	Similar to C3, sample discarded	
75				C5	0.3 [6]	75.5	Similar to C3; sample discarded Note: from start of run, drill rig was "bogging down", trying to stall, barely could spin the core barrel; diamond kept plugging	
				C6	0.0 [0]	80.5	Advanced core barrel through sand (no stones encountered) w/ great difficulty; prior to starting C6, approximately 4.0' of sand entered core barrel; once again, drill rig trying to stall and was bogging down with attempted advancement	
85						83.0	Further advanced hole utilizing 3" roller bit as a probe; noted increase in stones to include cobbles from beyond 83.5'; material became coarser w/ depth; no water return during any advancement of bit	
							-GLACIAL FLUVIAL-	
95							Advanced hole further w/ 3" roller bit to 105.0'; bit attempting to plug at approximately 100.0'; occasional cobble encountered; mainly sands with varying amounts of gravel	
100								

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MATERIALS & RESEARCH BUREAU - GEOTECHNICAL SECTION



BORING NO. **B04**

SHEET NO. 4 OF 4

STA. _____ OFF. _____

BASELINE Route 302 CL

ELEVATION (ft) 880.6

PROJECT NAME **HARTS LOCATION 16396A** BRIDGE NO. 235/059

DESCRIPTION Bridge Replacement - Rte 302 over Sawyer River

DEPTH (ft)	STRATUM CHANGE (ft)		BLOWS PER 0.5 ft	SAMPLE NUMBER	SAMPLER RECOVERY (ft) [%]	DEPTH RANGE (ft)	FIELD CLASSIFICATION AND REMARKS	STRATUM SYMBOL
	DEPTH	ELEVATION						
105							-GLACIAL FLUVIAL-	
							Bottom of Exploration @ 105.0 ft (El. 775.6)	
110								
115								
120								
125								
130								
135								

Appendix B
1989 Test Boring Logs
(B1 through B4)

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
MATERIALS AND RESEARCH DIVISION - SOILS SECTION

PROJECT Harts - LocationalPROJECT NO. P-4265

BRIDGE NO. 235 / 059

HOLE NO. *B1*

SHEET NO. 1 OF 1

STA 570+80 OFFSET A-73

BASELINE Rte 302 Survey

ELEVATION 875.1

DATE START 4/13/89

DATE FINISH 4/20/89

DRILLER T. Greenwood

INSPECTOR S. Myers

CLASSIFIED BY S. Miers

GROUNDWATER		DEPTH TO:			CASING		SAMPLER		CORE BARREL		ELEVATION	DATE START	DATE FINISH	DRILLER	INSPECTOR	CLASSIFIED BY
DATE	TIME	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:											
4/20/89	PM	11.2	17.5	30.0		BW	S	BW/AK/AX								
					SIZE I.D.:	2 3/8	1 3/4	1 7/8	1 7/8	1 7/8						
					HAMMER WT.:	—	140									
					HAMMER FALL:	—	30"									

DEPTH IN FEET	STRATA CHANGE	CASING BLOWS PER FOOT	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	RECOV. ERY	FIELD CLASSIFICATION AND REMARKS	
5			12	S1	0.0	1.4	Med Dense (Frozen) BIK. - DRK BRN ORGANIC Litter w/ Roots - Natural -	
			7		—		Med Dense (Frozen) BROWN Silty FINE SAND w/ Roots	
			9		2.0		Dense Yellow BRN. Cis FINE SAND + GRAVEL	
			10	S2	2.0	1.8	Dense - Ditto -	
			23		—			
			19		4.0			
			34		4.0			
			21	S3	—	1.1	Very Dense BROWN - Ditto -	
			30		6.0			
			17		6.0			
		45	S4	6.6	0.1	Very Dense - Poor Sample - (likely the same)		
		50		6.6				
10							ADVANCE w/ BW + NX Diamonds through Excessive Boulders in Soil	
15			11	S5	14.5	0.9	Very Dense TAN Silty FINE SAND, Little gravel (Brn. Mattles) (Same Weak Strata)	
			28		—		Very Dense Olive TAN Gravelly Cis FINE SAND, Little Tr. Silty	
			27		16.5			
			32	S6	16.5	0.6	Very Dense Olive TAN Very Gravelly Silty FINE SAND, Tr. Cis Med. Sand	
			39		—			
			41		18.3			
			33		18.5			
			473	50	0.7	0.0	NO sample	
	20							ADVANCED w/ AX Diamond through Boulder
25			12	08	21.5	0.8	Dense TAN Med SAND, Little Tr. Cis FINE SAND, Little Tr. Gravel, Tr. Silty (Cis - ASH THAN RETAINED)	
			26		—			
			20		23.5			
					23.5		ADVANCED w/ AX Diamond through Stones	
					—			
					25.0	20.5	Very Dense Oliv. TAN Gravelly Silty, F. SAND, Little Tr. Cis Med. Sand (w/ S)	
			14	09	26.0			
			100	26.0				
							ADVANCED w/ AX through Many Boulders and smaller Stones in Soil	
							Bottom of Exploration at 30.0 FT	

Sample	Identification	COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
		Blows/Ft.	Consistency	Blows/Ft.	Density	Capitalized Letters	Major Component
S	Split Spoon						
T	Thin Wall Tube	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	20% - 50%
U	Undisturbed Piston	2 - 4	Soft	5 - 10	Loose	Little	10% - 20%
O	Open End Rod	5 - 8	Medium Stiff	11 - 24	Medium Dense	Trace	Less than 10%
W	Wash Sample	9 - 15	Stiff	25 - 50	Dense	<i>Note: Both indicators same textural descriptions as overlying sample.</i>	
A	Auger Flight Sample	16 - 30	Very Stiff	50+	Very Dense		
C	Rock Core	31 - 60	Hard				
		60+	Very Hard				

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
MATERIALS AND RESEARCH DIVISION - SOILS SECTION

PROJECT HARTS Location

PROJECT NO. P-4266

BRIDGE NO. 235 / 059

HOLE NO. B2

SHEET NO. 1 OF 2

STA 500+90 OFFSET R+27

BASELINE Rte 302 Survey

ELEVATION 274.1

DATE START 4/12/89

DATE FINISH 4/13/89

DRILLER T. Greenwood

INSPECTOR S. Moore

CLASSIFIED BY S. Moore

GROUNDWATER		DEPTH TO:		CASING		SAMPLER	CORE BARREL
DATE	TIME	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:		
4/12	PM	12.5	34.0	34.3		BW	BW
					SIZE I.D.:	2 3/4	1 3/8
					HAMMER WT.:	140#	2 3/8
					HAMMER FALL:	50"	—

DEPTH IN FEET	STRATA CHANGE	CASING BLOWS PER FOOT	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	RECOVERY	FIELD CLASSIFICATION AND REMARKS
5			4	S1	0.0	1.0	Loose Yell BRN Crs - Fine SAND + Gravel (w/ Bk Asphalt Particles Near Surface)
			4		1.8		
			50	C1	—		Very Dense - Boulder -
					—		
					—		
10	12.0		70	S2	4.5	0.7	Very Dense C-FINE SAND + GRAVEL - Four SAMPLES -
					4.8		
				C2	—		- Boulder -
					—		
					—		
15			56	S3	10.0	1.2	Very Dense Dark Grey Very Gravelly Crs-Fine SAND, Little Silt, (Stones Likely)
			45		—		
			36	S4	12.0	1.0	Very Dense Yell. BRN Very Gravelly Crs-Fine SAND, Tr. Silt, (Stones Likely)
			36		12.0		
			15		12.0		
20			19	S5	14.0	1.1	Dense TAN-STRATIFIED - Silt, Fine SAND + Med-Fine SAND
			18		14.0		
			15	S6	16.0	0.8	Dense TAN Med-Fine SAND, Little Tr. Gravel, Tr. Crs. SAND
			13		16.0		
			14		16.0		
25			18	S7	18.0	1.0	Dense TAN-Weak STRATA - Crs-Fine SAND (Mostly Med) incl. Silt, Fine SAND (Last 4" - Fine SAND, Tr. Gravel)
			18		18.0		
			15	S8	20.0	0.9	Dense Lt. TAN Med. SAND, Little Crs. SAND, Tr. Fine SAND, Tr. Gravel
			12		20.0		
			11		22.0		
			8	S9	22.0	0.9	Med. Dense TAN Fine SAND, Tr. Med. SAND
			9		22.0		
			11	S10	24.0	1.1	Med. Dense - Ditto -
			12		24.0		
			10		26.0		
			6	S11	26.0	1.0	Med Dense TAN-Weak STRATA - Fine SANDs, incl. Tr. Silt
			9		26.0		
			11	S12	28.0	1.1	Med Dense TAN STRATIFIED FINE SANDS
			13		28.0		
			5		28.0		
			6	S12	30.0	1.1	Med Dense - Ditto -
			10		30.0		
			15		30.0		Dense TAN-STRAT-F. SAND - silt, Tr. F. SAND, + incl. M-F SAND (Brown)

Sample	Identification	COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
		Blows/Ft.	Consistency	Blows/Ft.	Density		
S	Split Spoon	0 - 1	Very Soft	0 - 4	Very Loose	Capitalized Letters	Major Component
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Lower Case Adjective	20% - 50%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	Less than 10%
W	Wash Sample	16 - 30	Very Stiff	50+	Very Dense	Note: Ditto Indicates Same	
A	Auger Flight Sample	31 - 60	Hard			Textural Description As Overlying	
C	Rock Core	60+	Very Hard			Sample	

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
MATERIALS AND RESEARCH DIVISION - SOILS SECTION
PROJECT Harris Location
PROJECT NO. P-4366 BRIDGE NO. 235 / 059

HOLE NO. B2
SHEET NO. 2 OF 2
STA 500 + 70 OFFSET R+27
BASELINE Rt. 302 Survey
ELEVATION 874.1
DATE START 4/12/89
DATE FINISH 4/13/89
DRILLER T. Greenwood
INSPECTOR S. Myers
CLASSIFIED BY S. Myers

GROUNDWATER		DEPTH TO:		CASING	SAMPLER	CORE BARREL
DATE	TIME	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:	
		SEE	PAGE 1		SIZE I.D.:	SEE PAGE 1
					HAMMER WT.:	
					HAMMER FALL:	

DEPTH IN FEET	STRATA CHANGE	CASING BLOWS PER FOOT	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	RECOVERY	FIELD CLASSIFICATION AND REMARKS
35		6	7	S13	30.0	0.5	Med. Dense TAN Med-Fine SAND, Tr. CLS SAND, Tr. Fine Gravel
		10	14		32.0		
		8	10		32.0		
		10	14	S14	34.0	1.2	Med. Dense TAN Fine SAND, Tr. Med. SAND
		50	50		34.0		
					34.0		
							Bottom of Exploration at 34.3 Ft.

Sample	Identification	COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
		Blows/Ft.	Consistency	Blows/Ft.	Density		
S	Split Spoon	0 - 1	Very Soft	0 - 4	Very Loose	Capitalized Letters	Major Component
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Lower Case Adjective	20% - 50%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Little	10% - 20%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Trace	Less than 10%
W	Wash Sample	16 - 30	Very Stiff	50+	Very Dense		
A	Auger Flight Sample	31 - 60	Hard				
C	Rock Core	60+	Very Hard				

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
MATERIALS AND RESEARCH DIVISION - SOILS SECTION

PROJECT HARD'S LOCATION

PROJECT NO. P-4366

BRIDGE NO. 235 / 059

HOLE NO. R3

SHEET NO. 1 OF 1

STA 501+90 OFFSET R+45.5

BASELINE Rte 302 Survey

ELEVATION 866.9

DATE START 4/11/89

DATE FINISH 4/13/89

DRILLER K. DANE

INSPECTOR S. Myers

CLASSIFIED BY SM

GROUNDWATER		DEPTH TO:		CASING		SAMPLER	CORE BARREL
DATE	TIME	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:		
4/13	AM	5.6	0.0	9.1		BW	S
					SIZE I.D.:	2 3/8	1 7/8
					HAMMER WT.:	140#	1 1/2
					HAMMER FALL:	30"	

DEPTH IN FEET	STRATA CHANGE	CASING BLOWS PER FOOT	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	RECOVER.	FIELD CLASSIFICATION AND REMARKS
5			5		0.0		Loose Surface Organic / Sandy Topsoil - Natural -
			18	S1	1.4	0.5	Very Dense Yell. Brn. Cfs - Fine Sand + Gravel (Larger Stones evident)
			50	ADV.	2.0		
			50	ADV.	4.0		Very Dense - Ditto -
			50	ADV.	4.25		
10				C1	-	4.8	
					9.1		
				C2	-	1.7	
					11.0		
				C3	-	1.9	
15					14.0		
					17.0		
				C4	-	0.0	
					19.0		
				C5	-	1.5	
20					19.0		
					23.0		
					23.0		
25							

Bottom of Exploration at 23.0 Ft.

Sample Identification		COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
Sample	Identification	Blows/Ft.	Consistency	Blows/Ft.	Density	Capitalized Letters	Major Component
S	Split Spoon	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	20% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Little	10% - 20%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Trace	Less than 10%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense	Note: Ditto Indicates Same Textural Description As Overlying Sample.	
W	Wash Sample	16 - 30	Very Stiff	50+	Very Dense		
A	Auger Flight Sample	31 - 60	Hard				
C	Rock Core	60+	Very Hard				

TEST BORING REPORT

STATE OF NEW HAMPSHIRE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
MATERIALS AND RESEARCH DIVISION - SOILS SECTION
PROJECT HASTE Location
PROJECT NO. P-4366 BRIDGE NO. 235 / 059

HOLE NO. R4
SHEET NO. 1 OF 1
STA 501+86 OFFSET RT 89
BASELINE Rte 302 Survey
ELEVATION 868.6
DATE START 4/13/89
DATE FINISH 4/18/89
DRILLER K. DANE
INSPECTOR S. Myers
CLASSIFIED BY S. Myers

GROUNDWATER			DEPTH TO:		CASING	SAMPLER	CORE BARREL
DATE	TIME	WATER	BOTTOM OF CASING	BOTTOM OF HOLE	TYPE:		
4/18/89	PM	5.9	0.0	25.0			
					SIZE I.D.:		
					HAMMER WT.:		
					HAMMER FALL:		

DEPTH IN FEET	STRATA CHANGE	CASING BLOWS PER FOOT	SAMPLER BLOWS PER 6 INCHES	SAMPLE NUMBER	SAMPLE DEPTH RANGE	RECOVERY	FIELD CLASSIFICATION AND REMARKS
			50	51	8.1		SURFACE ORGANIC (LEAF LITTER) TO STONE
5					5.0		CONTINUOUS ADVANCING w/ Wireline RUNS through Soil CONTAINING Very High Percentage of Boulders and Smaller STONES.
10					10.0		
15					15.0		
			89	52	15.5	0.3	Very Dense Gravelly Crs. Med. SAND Fr. FINE SAND (Cobbles likely)
			55		15.5		
			23	03	17.0	0.0	
			17		17.0		
			15		17.0		
			24	54	19.0	0.7	DENSE TAN-Olive TAN Very Gravelly Silty F. SAND, Little Crs. Med. Sand, w/ Cobbles
			18		19.0		
			30		19.0		
20			23	55	21.0	0.6	Dense - Ditto -
			23		21.0		
			21		21.0		
			28		21.7	0.2	Very Dense Poor Sample - To Stone
			50/238	56	21.7		
					25.0		ADVANCED through Couple Boulders and into Soil Last Foot of RUN using AX Wireline
25					25.0		Bottom of Exploration AT 25.0 Ft.

Sample	Identification	COHESIVE SOILS		NON-COHESIVE SOILS		Soil Descriptions	Proportion
		Blows/Ft.	Consistency	Blows/Ft.	Density	Capitalized Letters	Major Component
S	Split Spoon	0 - 1	Very Soft	0 - 4	Very Loose	Lower Case Adjective	20% - 50%
T	Thin Wall Tube	2 - 4	Soft	5 - 10	Loose	Little	10% - 20%
U	Undisturbed Piston	5 - 8	Medium Stiff	11 - 24	Medium Dense	Trace	Less than 10%
O	Open End Rod	9 - 15	Stiff	25 - 50	Dense		
W	Wash Sample	16 - 30	Very Stiff	50+	Very Dense		
A	Auger Flight Sample	31 - 60	Hard				
C	Rock Core	60+	Very Hard				

NOTE: DITTO INDICATES SAME TEXTURAL DESCRIPTION AT OVERLYING SAMPLE

Appendix C
Grain Size Distribution Curves

U.S. GRAIN SIZE SIGHTWPROJECTSHARTS LOCATION\16396A\TEST BORINGS.GPJ 11/21/2011 3:27:16 PM U.S. GRAIN SIZE

